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| APPLICATION NO.               | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-------------------------------|-------------|----------------------|---------------------|------------------|
| 10/736,708                    | 12/17/2003  | Motoomi Arakawa      | 0020-5209P          | 5696             |
| 2292                          | 7590        | 03/14/2005           | EXAMINER            |                  |
| BIRCH STEWART KOLASCH & BIRCH |             |                      | PENG, KUO LIANG     |                  |
| PO BOX 747                    |             |                      | ART UNIT            | PAPER NUMBER     |
| FALLS CHURCH, VA 22040-0747   |             |                      | 1712                |                  |

DATE MAILED: 03/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/736,708

Applicant(s)

ARAKAWA ET AL.

Examiner

Kuo-Liang Peng

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12/17/03 Preliminary amendment.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☒ Claim(s) 7 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 6/8/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. The Applicants' preliminary amendment filed on December 17, 2003 was received. Claims 11-14 are amended. Now, Claims 1-15 are pending.
2. Applicants should notice that the foreign priority document, JP 2002-365499, has not been received.

#### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:  
  
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claims 2-7 and 9-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In Claim 2 (line 8), it is not clear as to what "compatible" refers to.

#### ***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-6, 8, 10, 13 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Plueddemann (US 3 567 497).

For Claims 1-6, 10 and 13, Plueddemann discloses a copolymer resulted in the preparation of a composite articles comprising (1) base member on the surface of which is a hydrolyzate of a compound of the formula  $\text{CH}=\text{CRCOO}(\text{R}')_n\text{-R}''\text{SiX}_2$  in which R is a methyl radical or a hydrogen atom; R is a divalent group composed of carbon, hydrogen, and oxygen, the latter being in a configuration selected from the group consisting of ether linkages and hydroxyl groups, in R' the ratio of carbon atoms to oxygen atoms being not greater than 3 to 1 and R' being attached to both the COO and the R'' groups through CO linkages; a has a value of 0 or 1; R'' is an alkylene radical of from 1 to 4 carbon atoms and X is a monovalent hydrolyzable group and (2) a cured vinylic resin. For the purpose of this invention, R can be either hydrogen or a methyl radical, thus it is obvious that the term "acryloxy" as employed herein includes "methacryloxy" compounds. The silanes employed in this invention are of two types; namely, those of the formula  $\text{CH}_2=\text{CRCOOR}''\text{SiX}_3$  and those of the formula  $\text{CH}_2=\text{CRCOOR}'\text{-R}''\text{-SiX}_3$ . It is believed that the beneficial characteristics of the silanes of this invention reside in

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the acryloxy group at one end and the trifunctional silicon atom at the other. Thus, the purpose of R and R" is to provide stable bridges connecting the acryloxy group to the silicon atom. In essence, the siliceous material is contacted with the chosen polymerizable material, which can then be polymerized to whatever degree may be desired, ranging from partial polymerization to produce "pre-preg" type materials to complete

polymerization to produce finished articles. Molding compounds and the like can be produced by merely mixing the treated siliceous material into an appropriate resin or rubber. Organic resins and rubbers containing aliphatic unsaturation in the uncured state are well known materials, and any of such materials can be used in practicing the present invention. The benefits of the invention are particularly applicable to resins. The term "resin" is used herein in the conventional broader sense as being inclusive of materials which may not be resinous in their uncured or monomeric state, so long as they are used in a form which is polymerizable to a resinous state. The preferred vinylic compounds used herein embrace any polymerizable or copolymerizable compound containing the  $\text{CH}_2=\text{C}$  radical, i.e. a vinylic type group in a terminal position in the molecule. The vinyl group or

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substituted vinyl group can be attached to any other substituents as long as the resulting compound is one which is polymerizable. The polymerizable vinylic compounds are well known in the literature. It is to be understood, however, that the term "polymerizable" as employed herein, and as generally used in the art of organic polymers, does not necessarily mean that the compound must be one which can polymerize with itself. In other words, it includes vinylic compounds which can only copolymerize with other vinylic compounds. When the vinyl radical is attached to a benzene ring the reactant is, of course, styrene, when it is attached to a cyanide radical the reactant would be acrylonitrile. It can also be attached to carbon atoms which are themselves attached to other substituents as in the methacrylates or allyl derivatives such as diallylphthalate, triallylcyanurate, and the like, or the vinylic radical may be attached to a mere hydrocarbon chain of some sort as in isoprene. Thus it can be seen that the term "vinylic" is used herein even though the vinyl group forms a mere portion of a larger radical in a manner such that the entire compound itself would or could be given a name which does not employ the prefix "vinyl." Unsaturated polyester resins can be used. In general, they are the reaction products of alpha-beta

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ethylenically unsaturated dicarboxylic acids or anhydrides thereof with at least one polyhydric alcohol (ordinarily a dihydric alcohol, i.e., a glycol).

Typical acids which can be employed in producing such resins include maleic, fumaric, itaconic, citraconic, mesaconic and aconic acids, and maleic and citraconic anhydrides. Examples of suitable polyhydric alcohols include ethylene glycol, propylene glycol, neopentylene glycol, and diethylene glycol (i.e., 2,2'-dihydroxyethyl ether). Higher boiling alcohols which are sometimes used in place of or in conjunction with these glycols include

compounds such as 2,2-bis-(p-hydroxyethoxyphenyl)propane; 2,2-bis-(p-hydroxyethoxyethoxyphenyl)propane; 2,2-bis-(p-hydroxypropoxyphenyl)propane, and 2,2-bis-(p-hydroxyethoxybiphenyl)propane.

As is well known, the dicarboxylic acids listed above can be partially replaced in the polyester formulation by other dibasic acids, exemplified by adipic, succinic, sebacic, phthalic, isophthalic, terephthalic, and tetrachlorophthalic acids and anhydrides, any of which are typically employed in amounts up to 3 moles per mole of the alpha-beta unsaturated dibasic acid. Another typical modification of the polyester resins which can be employed herein is the acid half-ester reaction product of at least one polyhydric alcohol ester of an hydroxylated unsaturated fatty acid (such as castor oil) with the aforesaid unsaturated dicarboxylic acids or

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anhydrides. Esters of, for example, ricinoleic acid and ethylene or propylene glycol or glycerine and the like can of course be used to replace part or all of the castor oil in the latter modification. The preferred polyester resins can be defined as comprising an esterification product of an alpha-ethylenic, alpha, beta-dicarboxylic acid with a glycol, said product being an advanced linear polyester containing unesterified carboxyl groups and preferably having an acid number of from 5 to 100. As is well known, the linear polyester is ordinarily employed in admixture with a liquid monomeric unsaturated polymerizable compound, and hence the polyester should be miscible with and copolymerizable with said monomeric compound to yield a solid resinous material. Typical formulations of such mixtures range from 50 to 80 percent by weight of the polyester, and from 20 to 50 percent of the liquid monomeric compound. The liquid monomeric unsaturated compounds have the group  $>C=C<$  in their molecular structure, and are exemplified by compounds such as styrene, vinyl toluene, alpha-methylstyrene, divinylbenzene, 2,4-dichlorostyrene, vinyl acetate, methyl methacrylate, ethyl acrylate, diallyl phthalate, diallyl succinate, diallyl maleate, acrylonitrile, methylvinyl ketone, diallyl ether, methallyl alcohol, allyl crotonate, 1,3 -



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chloroprene, butyl methacrylate, allyl acrylate, and triallyl cyantirate. Mixtures of two or more of these monomers can also be used. The term "polyester resin" as used herein is intended to include the mixture of the linear polyester with the liquid monomeric unsaturated polymerizable compound as described above. The term also includes the polyester and the aforesaid mixture as conventionally used in conjunction with a polymerization catalyst and as used with other typical additives in such systems, as, for example, polymerization inhibitors or accelerators. (col. 1, lines 40-66, col. 4, lines 24-74 and col. 6, line 14 to col. 7, line 3) One of the copolymers formed is further illustrated in Example 6.

For Claim 8, as mentioned previously, vinylic monomers such as styrene, etc. can be used. (col. 4, line 43 to col. 5, line 28)

For Claim 15, note that although Plueddemann does not teach the method of making an organic-inorganic hybrid polymeric material. However, the instant claim is a Product-by-Process claim. "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the

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prior product was made by a different process” In re Thorpe, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

7. Claims 1-6, 8, 10, 13 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by GB405 (GB 735 405).

For Claims 1-6, 10 and 13, GB discloses a copolymer derived from a composition comprising a curable unsaturated polyester resin derived from phthalic acid, etc., ethylenically unsaturated hydrolyzable silanes and organic peroxides. (page 2, line 9 to lines 125 and Examples)

For Claim 8, comonomers such as styrene, etc. can be used. (page 2, lines 78-111)

For Claim 15, note that although GB405 does not teach the method of making an organic-inorganic hybrid polymeric material. However, the instant claim is a Product-by-Process claim. “Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the

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prior product was made by a different process” In re Thorpe, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

8. Claims 1-3, 5, 8, 10, 13 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Mitsutaka (GB 2 303 632).

For Claims 1-3, 5, 8 and 10, Mitsutaka discloses a copolymer derived from a monomer mixture comprising a) an alkoxysilane containing a radical-polymerizable group, b) a vinyl monomer copolymerizable with component a); and c-1) a polyester containing a radical-polymerizable group at one end. (page 4, 2<sup>nd</sup> and 3<sup>rd</sup> paragraphs to page 5, 1<sup>st</sup> paragraph) Component a) is described in page 5, 2<sup>nd</sup> paragraph and page 6, 1<sup>st</sup> and 2<sup>nd</sup> paragraphs. Component b) is described in page 6, 3<sup>rd</sup> paragraph. Component c-1 is described in page 7, 3<sup>rd</sup> paragraph and page 7, last paragraph, page 8, last paragraph and page 9, 1<sup>st</sup> paragraph. For Claims 13 and 15, Mitsutaka further teaches a method of hydrolysis-condensation of the copolymer. (page 19, 1<sup>st</sup> paragraph)

### ***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 1-6, 8-9 and 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arakawa (US 6 103 854) in view of Bigley (US 5 406 641) as evidenced by Odian (Principles of Polymerization, 2<sup>nd</sup> Ed., Wiley-Interscience, 1981, pages 226-242).

For Claims 1-6, 8-9, 11-13 and 15 (when Claim 15 depends on Claim 13), Arakawa discloses a process for preparing an organic-inorganic hybrid polymer material in which polymer (A) having at least one functional group in the molecule and a polycarbonate and/or a polyarylate moiety as a main frame, and metal alkoxide (B) having a functional group which may react with the functional group of polymer (A), are reacted to obtain polymer (C) having a metal alkoxide group as a functional group in the molecule, then the resulting polymer (C) is hydrolyzed and polycondensed to form an organic-inorganic hybrid polymer material having three-dimensional crosslinkages by the sol-gel method. The functional group in polymer A) can be a thiol group. As mentioned previously, the functional group in metal oxide B) must be reactive toward that in polymer A). The metal oxide B) can

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be (alkyl)alkoxysilanes having a vinyl group such as vinyltrimethoxysilane, vinyltriethoxysilane, and vinylmethyldiethoxysilane; or (alkyl)alkoxysilanes having a methacryl group such as 3-methacryloxypropyltrimethoxysilane, 3-methacryloxypropyltriethoxysilane, and 3-methacryloxypropylmethyldimethylsilane. Arakawa is silent on a specific reaction between the thiol group in polymer A) and the vinyl or (meth)acryl groups in the metal oxide. However, it is well known that a thio group can function as a chain transfer agent in a free radical polymerization. For example, Bigley teaches the use of a mercaptan as a chain transfer agent in the polymerization of a mixture containing 3-methacryloxypropyltrimethoxysilane. (col. 22, lines 19-41 and Examples). The motivation of using Bigley's method is to functionalize polymer A) containing thiol groups with metal oxide B) containing ethylenically unsaturated moieties. In light of the benefit mentioned, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to utilize Bigley's method for reacting the polymer A) and polymer B). Should Applicants argue that Arakawa is a non-analogous art for the purpose of rejection, Applicants are referred to MPEP 2141.01(a) which states that a reference may be relied on as a basis for rejection of an applicant's invention if it is "reasonably pertinent to the particular problem with which the inventor is concerned." A

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reasonably pertinent reference is further described as one which “even though it may be in a different field from that of the inventor’s endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor’s attention in considering his problem.” Therefore, although Arakawa is from different fields than that of the current application, it discloses teach a method for reacting a thiol group as a chain transfer agent with a ethylenically unsaturated alkoxysilane, which is especially pertinent to the invention at hand. For Claims 14 and 15 (when Claim 15 depends on Claim 14), a metal selected from the group consisting of Si, Ti, Zr, Fe, Cu, Sn, B, Al, Ge, Ce, Ta, and W, and a metal compound thereof such as metal oxide, metal complex, metal salt, and the like may further be employed in the hydrolysis and polycondensation reaction of the present invention, in view of further improving strength, hardness, weather resistance, chemical resistance, flame resistance, static resistance of the resulting material; for newly supplying the performance to the material; or for controlling the inorganic content or the crosslinking density of the material. (col. 3, lines 27-39, col. 6, lines 30-36) Note that polymer A) is preferably having the functional groups located in the polymer chain ends as indicated in Examples. Odian further teaches that a chain transfer agent will not stop the polymerization. Instead, after chain transferring, a new polymerization

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starts from the chain transfer agent. (Equation 3-113 to 3-115) Therefore, in Arakawa's disclosure, a block copolymer contains polymer A) as one type of the blocks and the polymerized ethylenically unsaturated alkoxysilane as the other type of blocks. Note Odian is cited here merely to show that the thiol groups in polymer A) function as polymerization sites.

11. Claim 7 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

None of the above references teaches or fairly suggest a copolymer containing the specific E structure set forth in the instant claim.

12. The "X" references cited in the international search report are not relied upon because of the following reasons:

EP 401 990 does not teach or fairly suggest the reactive silicon-containing group and polycondensation segment set forth in the present invention.

EP 449 613 does not teach or fairly suggest the reactive silicon-containing group set forth in the present invention.

JP 03-160010 does not teach or fairly suggest the polycondensation segment set forth in the present invention.

DE 196 29 926 has been applied using its equivalent, GB 2 303 632.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kuo-Liang Peng whose telephone number is (571) 272-1091. The examiner can normally be reached on Monday-Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached on (571) 272-1302. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).




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Kuo-Liang Peng  
Primary Examiner  
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**KUO-LIANG PENG**  
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